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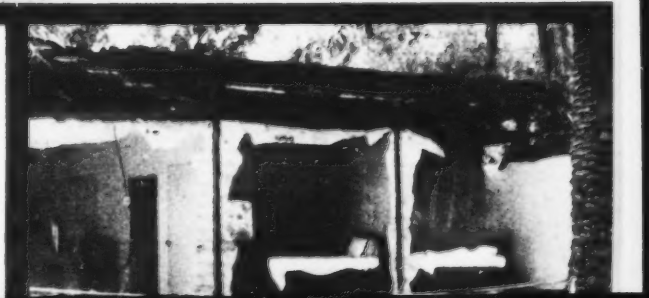
EARTHQUAKE AND TSUNAMI DATA SERVICES AND PUBLICATIONS

Key to Geophysical Records
Documentation No. 15 (REVISED)



U.S. DEPARTMENT OF COMMERCE

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

NATIONAL ENVIRONMENTAL SATELLITE, DATA, AND INFORMATION SERVICE

NATIONAL GEOPHYSICAL DATA CENTER / WORLD DATA CENTER A
BOULDER, COLORADO

December 1985

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KGRD CATALOG SERIES

Listed below are catalogs published in the Key to Geophysical Records Documentation (KGRD) series. Those without an asterisk (*) may be obtained from the National Geophysical Data Center, NOAA, Code E/GC1, 325 Broadway, Boulder, Colorado, USA, 80303. Those preceded by an asterisk may be obtained from the National Technical Information Service, U.S. Department of Commerce, Springfield, Virginia, USA, 22161. KGRD issues that have been superseded by later revisions are not available for purchase.

KGRD No. 1, Marine Geophysical Data Catalog (superseded by KGRD No. 4).
KGRD No. 2, Catalog of Strong-Motion Seismograph Stations and Records (superseded by Report SE-38, Catalog of Strong-Motion Accelerograph Records).
KGRD No. 3, Catalog of Earthquake Photographs (superseded by KGRD No. 20).
KGRD No. 4, Marine Geophysical Data Catalog--1975 (superseded by KGRD No. 14).

KGRD No. 5, Earthquake Data File Summary (superseded by KGRD No. 21).
*KGRD No. 6, Bibliography and Index to Literature on Manganese Nodules (1874-1975) (NTIS No. PB-257218).
KGRD No. 7, Catalog of Earthquake Photographs (superseded by KGRD No. 20).
*KGRD No. 8, Catalog of Digital Bathymetric Data for the United States Coastal Regions (NTIS No. PB81-133258).

KGRD No. 9, Catalog of Seismogram Archives.
KGRD No. 10, The Marine Geophysical Data Exchange Format--"MGD77".
KGRD No. 11, Summary of Digital Marine Geophysical Data Holdings (Bathymetric, Magnetic, and Gravimetric Data).
KGRD No. 12, Thermal Springs List for the United States.

KGRD No. 13, Catalog of Tsunami Photographs (superseded by KGRD No. 20).
KGRD No. 14, Marine Geology and Geophysics Data Services and Publications.
KGRD No. 15, Earthquake and Tsunami Data Services and Publications.
KGRD No. 16, Catalog of Geological and Geophysical Data for the National Petroleum Reserve in Alaska.

KGRD No. 17, Terrestrial Geophysics Data Services and Publications.
KGRD No. 18, U.S. Land Gravity.
KGRD No. 19, Summary of Earthquake Intensity File.
KGRD No. 20, Natural Hazards Photograph Catalog (superseded by Natural Hazards Photographs Brochure).
KGRD No. 21, Summary of Earthquake Data Base.

Cover: Photographs show damage resulting from the San Fernando, California, earthquake of February 9, 1971.

(Top) Olive View Hospital, Medical Treatment and Care Unit. Complex collapsed on first floor level. View of north side looking east.

(Middle) Left section of this private dwelling was originally two stories (over a garage) and attached to the one-story section on the right.

(Bottom) Veterans Administration Hospital, west elevation. Collapsed walls expose interior sections of Unit 28.

U.S. DEPARTMENT OF COMMERCE
Malcolm Baldrige, Secretary

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
Anthony J. Calio, Administrator

NATIONAL ENVIRONMENTAL SATELLITE, DATA, AND INFORMATION SERVICE
William P. Bishop, Acting Assistant Administrator

EARTHQUAKE AND TSUNAMI DATA SERVICES AND PUBLICATIONS

Key to Geophysical Records Documentation No. 15 (REVISED)

National Geophysical Data Center
World Data Center A for Solid Earth Geophysics
Boulder, Colorado
December 1985

READEX FICHE best copy available

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EARTHQUAKE AND TSUNAMI

DATA SERVICES AND PUBLICATIONS

INTRODUCTION

The National Environmental Satellite, Data, and Information Service (NESDIS) collects, manages, and disseminates the great mass of information produced by the scientific observation of interplanetary space and the physical world.

Data activities in seismology, gravity, geomagnetism, marine geology and geophysics, geothermics, and solar-terrestrial physics are directed by the NESDIS National Geophysical Data Center (NGDC) in Boulder, CO. NGDC also provides facilities for World Data Center-A (including the disciplines of Solid Earth Geophysics, Marine Geology and Geophysics, Solar-Terrestrial Physics, and Glaciology). This brochure briefly describes the products and services in seismology.

NGDC is a focal point for disseminating historical earthquake data and information to both technical and general users. Information on recently occurring earthquakes, however, is initially disseminated by the U.S. Geological Survey (USGS), which operates the National Earthquake Information Service (NEIS)—a service for rapid location of and gathering data about earthquakes. This information is then released to NGDC for further dissemination. From this data NGDC prepares seismic histories of local and regional areas; answers public inquiries on all aspects of historical earthquakes; publishes historical data compilations; and makes available digital strong-motion earthquake records, computer listings of earthquake locations, and other data in many formats.

Seismograms from global seismograph networks are no longer available from NGDC. Contact the U.S. Geological Survey (USGS) in Denver, CO, for information about analog seismograms. USGS also is responsible for data from the International Data Exchange Program, the Historical Seismogram Program, and the Global Digital Seismic Network.

The following sections describe the principal seismology and tsunami products available from NGDC. Copies of primary data and data products may be obtained for the cost of copying. Both NGDC and World Data Center-A for Solid Earth Geophysics encourage data-exchange agreements with other organizations. Please address requests for information on prices and data services to:

National Geophysical Data Center
NOAA, Code E/GC4
325 Broadway
Boulder, CO 80303

or call one of the *"Key Contacts"* listed on the inside-back cover.

THE CITY IN FLAMES

San Francisco, California—Apr. 18, 1906

DATA SERVICES

Earthquake data services provided by NGDC include selected retrieval and output of data from the Earthquake Data Base (including data inventory searches, data plots, and magnetic tape copies), photographs of earthquake and tsunami damage, magnetic tape copies of strong-motion accelerograph records, and copies of intensity, seismicity, and tsunami maps. Brief descriptions are given of each data set and of the general formats in which the data are available.

EARTHQUAKE DATA BASE

The *Earthquake Data Base* contains information on more than 500,000 earthquakes, known or suspected explosions and associated collapse phenomena, coal bumps, rockbursts, quarry blasts, and other earth disturbances recorded worldwide for the period 2100 B.C. to the present. It includes date and origin time of the event, geographic location, depth, magnitude, maximum intensity, and related earthquake phenomena (including casualties, damage, faulting, tsunami, volcanism, and others). *Summary of Earthquake Data Base, KGRD-21,* describes this valuable set of data.

The data are useful for providing to the scientific and engineering community several kinds of computer searches describing the seismicity of selected regions; for preparing lists of earthquakes sorted in several ways (e.g., date, region); and for making statistical studies of earthquake occurrence.

The file was formed from data furnished by the U.S. Geological Survey (in earlier years by the U.S. Coast and Geodetic Survey and the National Oceanic and Atmospheric Administration), the California Institute of Technology (Pasadena), the University of California (Berkeley), the California Division of Mines and Geology (Sacramento), and many other sources worldwide. Data for large historical earthquakes are included for earlier years (about 2100 B.C. to A.D. 1897). The file can be purchased in the following formats:

- Computer listing of data inventory search (see example on p. 3) by any combination of the following elements:
  1. Geographic boundaries (top, bottom, left, right)
  2. Area within a radius (in kilometers or degrees) around a center point (e.g., 100-km radius, 40° N, 112° W)
  3. Time period (e.g., 1930-40)
  4. Date and time of occurrence
  5. Modified Mercalli intensity (intensity I to XII)
  6. Depth
  7. Magnitude range
  8. Cultural effects (e.g., damage, casualties)
  9. Associated phenomena (e.g., faulting, tsunamis, volcanism)
- Magnetic tape (9-track; 1,600 or 6,250 bpi; ASCII or EBCDIC character sets) or microfiche (105-mm) in:
  1. Chronological sort
  2. Geographical sort
- Customized publication-quality maps (on mylar)
- Page-size maps (paper copy)
- Scaled maps (mylar or paper copy)
- Vertical cross-sections (mylar or paper copy)
- Quarterly updates on magnetic tape (PDE only).

SIGNIFICANT EARTHQUAKES DATA BASE

The *Significant Earthquakes Data Base* includes information on about 2,500 earthquakes (recorded in 114 scientific or scholarly sources) that meet one or more of the following criteria: $1 million (1979 dollars) or more damage, at least 10 deaths, magnitude 7.5 or larger, or Modified Mercalli intensity X or larger. Given for each earthquake are date and time of occurrence, latitude and longitude, depth, magnitude, number of casualties, damage, and literature citations.

This data base also is available in publication format as *Catalog of Significant Earthquakes, 2000 B.C.- [A.D.] 1979,* Report SE-27 (see p. 8). And it may be purchased on 9-track magnetic tape (800, 1,600, or 6,250 bpi) in either ASCII or EBCDIC character sets.

EARTHQUAKE INTENSITY DATA

The *Earthquake Intensity Data Base* contains about 140,000 earthquake intensity (Modified Mercalli—MM) observations gathered from many sources. The data represent 21,000 events for the period 1638 to 1981. Each listing contains date, time, and location of earthquake (where available); name of reporting towns and their geographic locations; and Modified Mercalli intensity at each town. Principal sources used in compiling the data are: *United States Earthquakes* (for the years 1928-1981) and *Earthquake History of the United States* (for the years 1638-1980). Intensity data can be furnished in the following formats. *Summary of Earthquake Intensity File, KGRD-19,* describes this data base.

- Computer listings of data inventory search using any combination of the following elements:
  1. Geographic coordinates (e.g., events felt at or originating around a specific point or within a radius around a center point)
  2. Time period (e.g., 1930-40)
  3. Date and time of occurrence
  4. Modified Mercalli intensity
  5. City or State name
- Magnetic tape (9-track; 1,600 or 6,250 bpi; ASCII or EBCDIC character sets)
- Microfilm (16-mm) of raw data (felt and not-felt questionnaire reports, newspaper clippings, letters)

Example of Computer Retrieval from EARTHQUAKE DATA BASE

J. COFFMAN, NATIONAL GEOPHYSICAL DATA CENTER 12/31/85 10:25:30

RADIAL SEARCH--NORTHEASTERN CALIFORNIA

Dup	Source	Date yr	mo	dy	Time hr	mn	sec	Location Latitude		Longitude		Depth km	Magnitudes mb	MS	Other	Local	Int Map	Int Max	DTSVNHUI	F-E	CE	Q/N	Distance km
								deg		deg													
	USN	1867	12	02	07	12		39.3	N	121.	W							VI		036		H	48
	USN	1869	12	27	10			39.2	N	121.6	W							VI		036		H	31
	USN	1871	03	02			X	39.3	N	121.6	W							VII		036		H	41
	EQH	1888	04	29	04	48	Z	39.5	N	121.	W							VII		036	D		66
	EQH	1892	04	21	17	43	Z	38.5	N	122.	W							IX		036	D		76
1***	USN	1892	04	21	17	43		38.5	N	122.	W							IX		036		G	76
	EQH	1902	05	19	18	31	Z	38.5	N	122.	W							VIII		036	D		76
1***	USN	1902	05	19	18	31		38.5	N	122.	W							VII		036		G	76
	EQH	1903	07	24	20	26	Z	39.5	N	122.	W							VII		036	D		79

TSUNAMI DATA

NGDC/WDC-A has compiled a set of data bases of direct interest to tsunami research and operations. These include marigraphic data from tide records; digital bathymetric data; tsunami historical data; and information on tsunami effects, including a photograph file of tsunami damage. Specific holdings include:

Tide Records (since 1850) from Pacific tide stations that show tsunami activity. About 3,000 station events are available on microfilm.

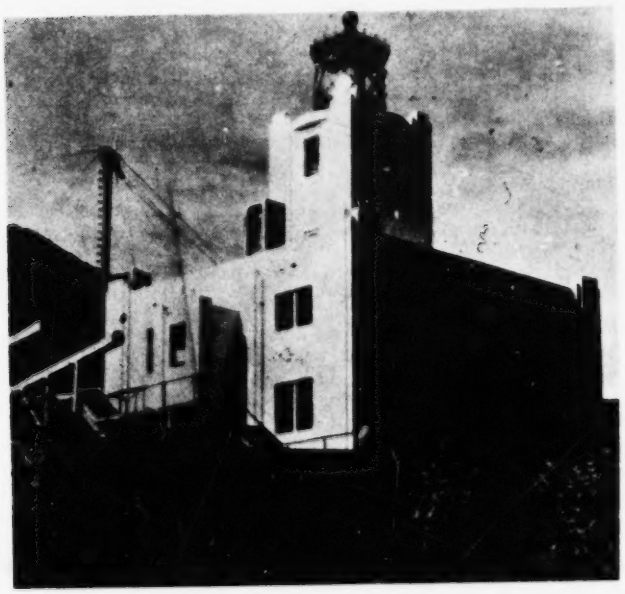
Bathymetric Data (on magnetic tape) of 30 million U.S. coastal bathymetric observations collected since 1930. These tapes can be formatted for specific needs.

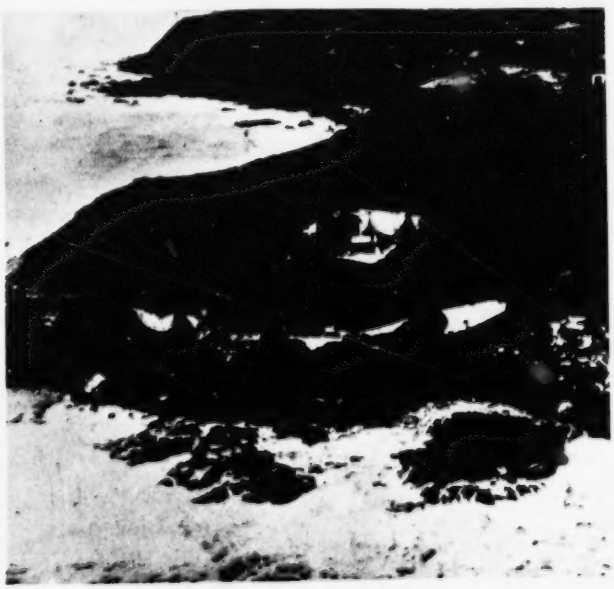
Tsunami Historical File, which includes some or all of the following elements for each event: event date of tsunamigenic earthquake, source region, validity rating, latitude, longitude, depth, and magnitude of generating earthquake, tsunami magnitude and intensity, and literature citations.

Map of Pacific Ocean Basin Tsunamis, 1900-1983, depicts all events (including earthquakes, volcanic eruptions, and landslides) that generated tsunamis in the Pacific Basin from 1900 to 1983. The magnitude range of the earthquakes that generated tsunamis and the maximum runup height onshore are given. The relation between a tsunami source region and the areas where that tsunami was observed is also depicted. The information presented on this map is helpful in identifying areas that are at risk to tsunami damage, as well as areas that may generate destructive tsunamis. Tabular data provide additional information about the events, including an indication of the destruction and number of deaths that resulted.

Photographic Data, including more than 700 photographs of tsunami wave activity and damage. Request brochure for list of tsunami events and types of photographs available.

Tsunami Slide Set—Twenty 35-mm slides of tsunami damage. See description in the section "Other Seismological Data."





Damage at Unimak Island, Alaska, caused by tsunami of April 1, 1946. Before and after views of Scotch Cap Lighthouse.

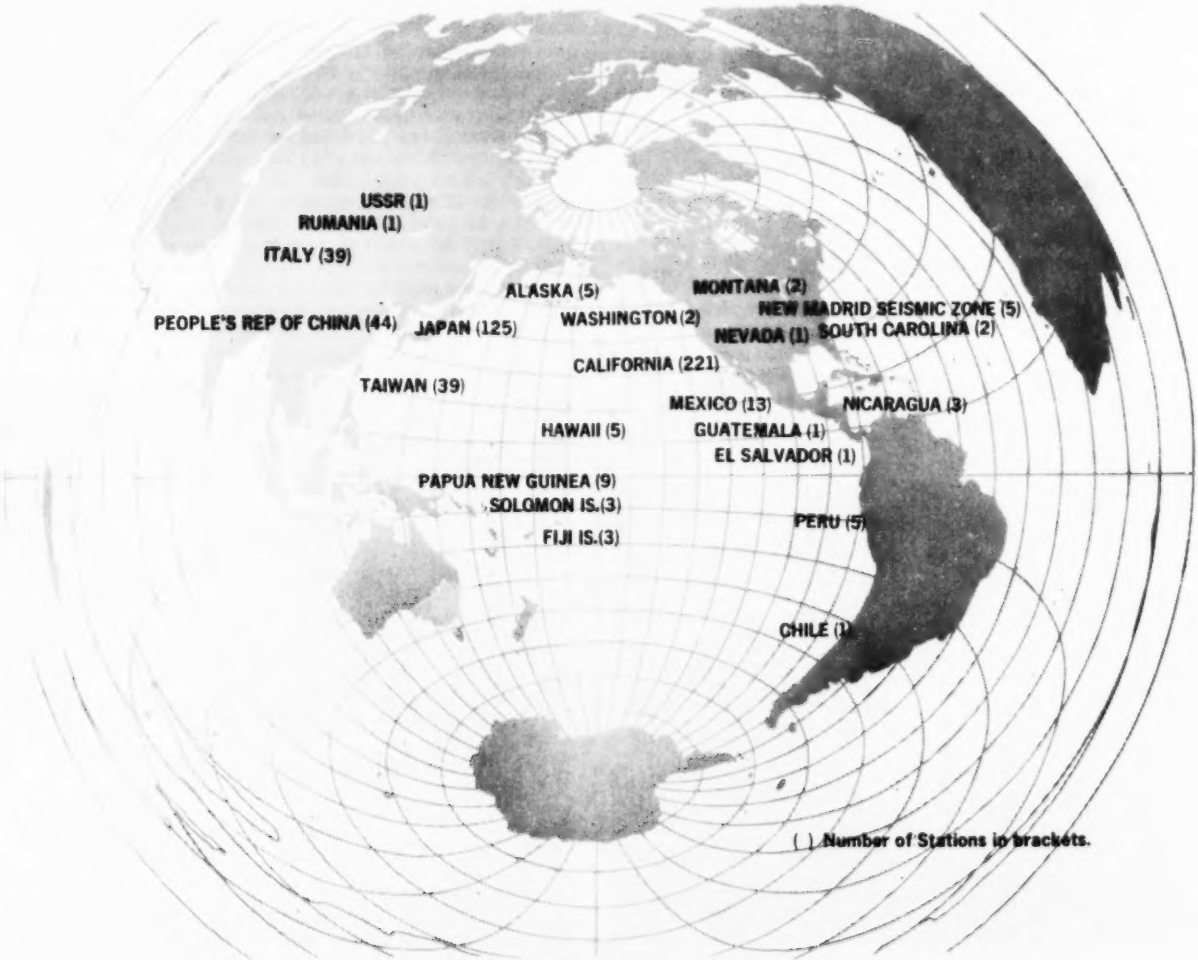
STRONG-MOTION EARTHQUAKE DATA

The Strong-Motion Earthquake Data inventory contains the most significant strong-motion records (highest acceleration of gravity, for example) from the United States and other areas of the world from 1933-85. It holds information on about 350 earthquakes that occurred in 15 different countries or island groups. A publication, *Catalog of Strong-Motion Accelerograph Records*, Report SE-38, that describes the NGDC strong-motion program is available upon request.

Most of the records have been digitized and are available on magnetic tape. The file can be searched using specific characteristics (e.g., acceleration of gravity, date, State/country, station) and the results produced on computer printout. Some records produced in the United States have been further corrected and processed to obtain Fourier response spectra. The magnetic tapes holding strong-motion data have been standardized to be compatible with most computer tape drives. Digital strong-motion records are available from the following areas:

1. *Western Pacific Ocean:* Japan, Papua New Guinea, Fiji Islands, Solomon Islands.
2. *Western Hemisphere:* Chile, El Salvador, Mexico, Nicaragua, Peru, United States (Alaska, California, Hawaii, Mississippi, Missouri, South Carolina, Washington).
3. *Europe:* Italy, Rumania, USSR.
4. *Asia:* People's Republic of China; Taiwan, Republic of China.

In addition the analog data file contains preliminary, uncorrected records that are available on 35-mm microfilm, 70-mm film chips, or as paper copies. These records are available from the following countries: Chile, Costa Rica, Ecuador, El Salvador, Guatemala, New Zealand, Panama, Peru, United States, and Yugoslavia. A current list of strong-motion records in the NGDC library is available on request.



Locations of worldwide strong-motion stations that have contributed accelerograph records to NGDC

OTHER SEISMOLOGICAL DATA

The *Natural Hazards Photograph Data Base* brochure lists dates of the events that are represented by about 2,000 photographs. It briefly describes the formats in which photographs are available and gives details about special slide sets (35-mm) that may be purchased. The data base covers major earthquakes, tsunamis, and volcanic eruptions. The following 35-mm slide sets, suitable for both technical and lay audiences, are available:

1. The *Earthquake Damage Slide Set* contains 20 of the best photographs of earthquake damage in the Photograph Data Base. The set of 35-mm color slides graphically illustrates the geologic effects and the damage to man-made structures caused by 11 events that occurred in seven countries from 1959 through 1980. It illustrates several types of earthquake effects including strike-slip and thrust faulting; surface ruptures; landslides; fissuring; slumping; and sand boils. Structural damage caused by seismic vibration, soil liquefaction, slumping, and closeness to an active fault is depicted.

2. The *Earthquake Damage to Schools Slide Set* contains 20 color and black-and-white slides that show unique damage to school buildings throughout the world. They graphically illustrate the potential danger to our schools, and to the welfare of our children, as result of major earthquakes. Damage locations vary from Algeria, where a collapsed school roof is held up only by students' desks; to Anchorage, Alaska, where an elementary school structure has split in half; to California and other areas, where school buildings have sustained minor-to-severe damage to walls, roofs, and chimneys.

3. The *Tsunami Slide Set* includes 20 color and black-and-white slides of the best photographs in the NGDC Photograph Data Base. The set of 35-mm slides represents tsunami events that occurred in Alaska, Hawaii, Japan, and Midway Island. They depict advancing waves (including sequential views of waves approaching a coastline), harbor damage, and before-and-after scenes of damage. They also show views of the extent of inundation experienced along coastlines.

4. The *Volcanoes in Eruption Slide Set* contains 20 of the best photographs of eruption volcanoes from many parts of the world. The slides depict explosive eruptions, nuees ardentes, lava fountains and flows, steam eruptions, and fissure eruptions. Volcano types represented include caldera, cinder cone, complex, fissure vent, lava dome, shield, and island forming.

5. The *Volcanic Rocks Slide Set* contains 20 examples of several volcanic products and other magmatic features. An accompanying 12-page brochure describes the formation of volcanic features (including necks, dikes, and sills) and volcanic products (lava, ash, cinders, and bombs.)

The *Reid Earthquake Catalog* is a comprehensive collection of earthquake and volcano data detailed on 3- by 5-inch index cards and in newspaper clippings. The catalog, which is in chronological sequence and cross-indexed by geographical regions, covers the time from before Christ to 1931. Many of the original cards are handwritten; therefore, the photocopies are of variable clarity. Available on 16-mm microfilm.

Historical Seismograph Station Bulletins including more than 400,000 pages from about 500 seismograph station bulletins worldwide are available on 16-mm microfilm and 105-mm microfiche. Most of the bulletins were obtained from collections held by Saint Louis University and the National Geophysical Data Center. Although the present collection is not complete, it represents a significant portion of the seismological data published in the period 1900-65. See description of Report SE-37 on page 8.

Data from California Institute of Technology (CIT) Seismological Laboratory include:

1. A collection of 112 rolls of 16-mm microfilm containing photocopies of original seismogram phase cards from the CIT network of stations for the Oct. 1931 to Dec. 1969 period. Individual microfilm rolls contain several months of data from as many as 18 stations. Available in individual rolls or as a complete set. In addition, one reel of 16-mm microfilm containing Charles F. Richter's notes on Southern California local shocks, 1926-39, and the Long Beach, California, series, 1933-35, is available.

2. A collection of microfiche copies of the Regular Bulletin of Pasadena and Auxiliary Stations for 1931-57, Preliminary Bulletin 1957-68; Provisional Readings 1966-74; and Airletters 1974-79.

Bulletin of Seismographic Stations, University of California, Berkeley, is a collection of 46 "volumes" of network data for Oct. 30, 1910, to Dec. 31, 1976. Each volume includes several microfiche covering a 1-year period (except the following: Vol. 1, Oct. 30, 1910-Sept. 30, 1920; Vol. 2., Oct. 1, 1920-Mar. 31, 1931; Vol. 3, Apr. 1, 1931-Mar. 31, 1933; Vol. 4, Apr. 1, 1933-Mar. 31, 1935; Vol.5, Apr. 1-Dec. 31, 1935). Available in individual volumes or as a complete set.

SPECIAL SERVICES

Custom Plots

The National Geophysical Data Center produces earthquake maps of specific areas and specified projections on request. Costs depend on the complexity and the computer time required. The plots include:

- Customized publication-quality maps (on mylar)
- Page-size maps (paper copy)
- Scaled maps (mylar or paper copy)
- Vertical cross-sections (mylar or paper copy)

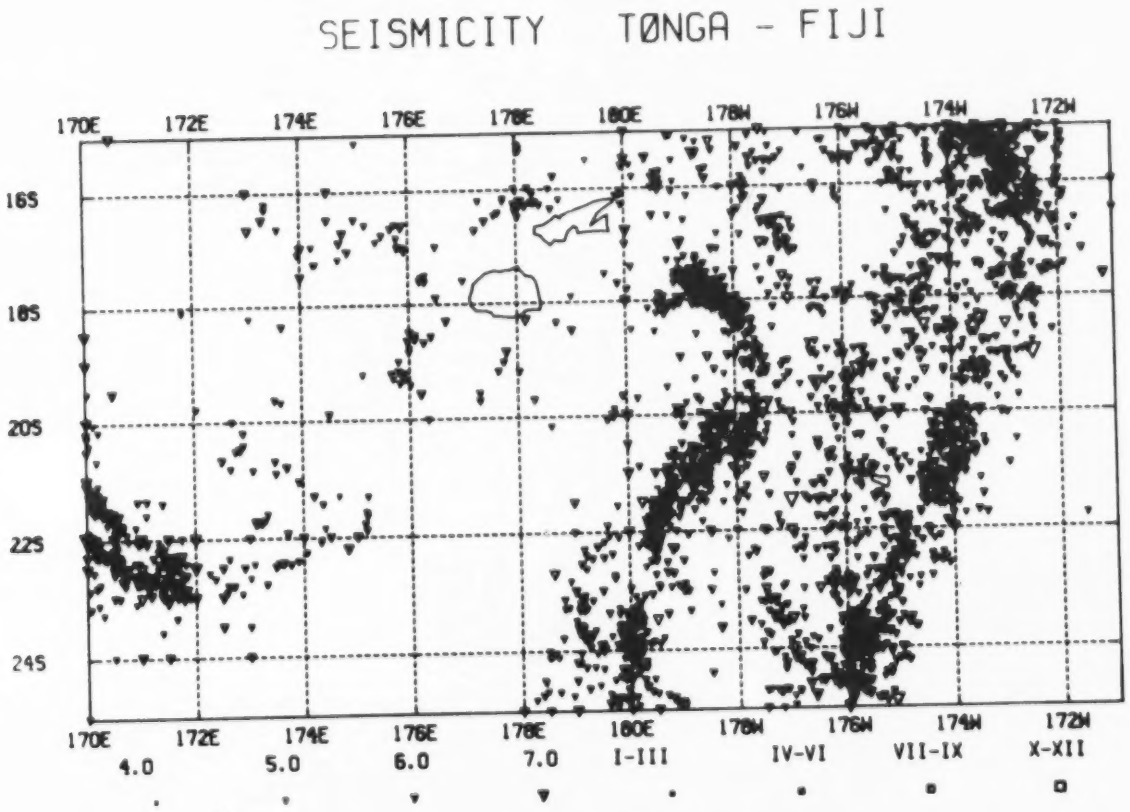
Visiting Scientists

NGDC operates a modest guest-worker program and provides space, access to computers, digitizers, plotters, and data files to researchers who need to access large amounts of data. Contact NGDC for details.

NGDC no longer manages the Worldwide Network of Standard Stations seismograms. This program is operated by the U.S. Geological Survey (USGS) in Denver, CO. Contact USGS for details.

Requests Through World Data Center A

World Data Center A for Solid Earth Geophysics assists scientists to obtain copies of original or calibrated data held by other scientists or other World Data Centers. Requests should be sent to World Data Center A for Solid Earth Geophysics. National Geophysical Data Center, NOAA, Code E/GC1, 325 Broadway, Boulder, CO 80303 USA.



Example of Earthquake Data Plot

PUBLICATIONS

(Including Earthquake, Tsunami, Volcano)

The following data publications have been prepared by components of the National Oceanic and Atmospheric Administration (NOAA) and the U.S. Geological Survey (USGS). They are presented in five categories: regular, tsunami, popular, miscellaneous, and maps. Although partially technical in character, many of them can be understood by the layman or educator interested in the general aspects of earth science information and present-day research. The "popular" section contains brochures and leaflets prepared in a nontechnical manner especially for the general public. Several of the publications are out of print, and are available only on microfiche from the National Technical Information Service (NTIS).

Regular Reports

Preliminary Determination of Epicenters Monthly Listing, prepared by the USGS, is a chronological listing of earthquakes located throughout the world. It gives date and time of occurrence, geographic coordinates, epicentral region, felt and damage comments, focal depth, magnitude, and other pertinent data for each tremor. (Available by subscription from Superintendent of Documents, see address inside-back cover.)

United States Earthquakes (1928 through 1981), prepared by USGS, is an annual summary of earthquakes in the United States and nearby territories. It gives brief descriptions of all felt and damaging tremors, and lists those that were recorded by seismograph stations but not felt by residents. Other sections describe geodetic work of seismological interest, tsunamis (earthquake-induced seawaves), and principal world earthquakes. (Available from USGS, Denver, address inside-back cover.)

Earthquake History of the United States, Revised Edition (Through 1970)—with Supplement (1971-80)—Publication 41-1, is a catalog of all important U.S. earthquakes (generally intensity V and above) of historical record. It contains descriptive text on each tremor and regional tables of earthquake locations, affected areas, and intensities. (Available from NGDC, address inside-back cover).

Earth slumping caused by Good Friday earthquake of March 27, 1964, in Anchorage, Alaska

Tsunami Reports

Catalog of Tsunamis in Alaska, Report SE-1, lists tsunamis from July 1788 through December 1974 and gives a brief description of each. (Available from WDC-A for Solid Earth Geophysics, address inside-back cover.)

Catalog of Tsunamis in Hawaii, Report SE-4, is a compilation of all data pertaining to tsunamis observed and instrumentally recorded in Hawaii from the early 1800s through December 1976. The list includes date, location, and magnitude of each earthquake and a brief description of tsunami effects. (Available from WDC-A for Solid Earth Geophysics, address inside-back cover.)

Tsunamis in Peru-Chile, Report SE-39, includes information from six coastal regions: Peru, North Chile, North-Central Chile; Central Chile; and South-Central Chile. Tabular information on the earthquakes that generated tsunamis in each of these regions includes description of damage, number of deaths, and names of cities that reported tsunami effects from Pacific-wide sources. The report also contains maps that show extent of coastline affected by several large earthquakes, and areas throughout the Pacific that have reported tsunamis generated near Peru and Chile. (Available from WDC-A for Solid Earth Geophysics, address inside-back cover.)

Miscellaneous Catalogs and Data Summaries

Summary of Earthquake Focal Mechanisms for the Western Pacific-Indonesian Region, 1929–73, Report SE-3, is a catalog that lists 1,713 solutions from 48 earthquakes, most of which occurred since 1960. It includes for each the data source, date and time of occurrence, epicenter, and magnitude. (Available from NTIS, address inside-back cover.)

Directory of Seismograph Stations (Participating in International Seismogram Exchange through World Data Centres), Report SE-7, lists 247 seismograph stations (and their technical characteristics) that have agreed to participate in Category ii data exchange through the World Data Centers. The directory contains the following data for most stations: (1) general information, (2) site information, (3) instrumentation, (4) timing system, (5) type of reports, (6) references, and (7) comments. (Available from NTIS, address inside-back cover.)

Survey of Practice in Determining Magnitudes of Near Earthquakes, Part 1: North, Central, and South America, Report SE-9, describes the methods used in determining magnitudes of near earthquakes at more than 100 seismograph stations throughout the world. (Available from NTIS, address inside-back cover.)

Survey of Practice in Determining Magnitudes of Near Earthquakes, Part 2: Europe, Asia, Africa, Australasia, the Pacific, Report SE-8, lists the methods used in determining magnitudes of near earthquakes at more than 100 seismograph stations throughout the world. (Available from NTIS, address inside-back cover.)

Homogeneous Magnitude System of the Eurasian Continent: P-Waves, Report SE-18, is a four-section summary that establishes a new procedure for determining the magnitude of an earthquake; the first stage of the investigation is described in this report. (Available from NTIS, address inside-back cover.)

Manual of Seismological Observatory Practice, Report SE-20, outlines the basic duties of an observatory—how to maintain equipment, how to produce seismograms, and how to undertake preliminary readings. (Available from WDC-A for Solid Earth Geophysics, address inside-back cover.)

Directory of World Seismograph Stations, Volume I, The Americas, Part 1, United States, Canada, Bermuda, Report SE-25, gives the location of seismological instruments, their technical characteristics, dates of operation, and availability of records. (Available from NTIS, address inside back cover.)

Catalog of Significant Earthquakes, 2000 B.C.— [A.D.] 1979, Report SE-27, contains a list of 2,484 earthquakes that meet any of the following criteria: $1 million or more property damage, at least 10 deaths, or magnitude 7.5 (or Modified Mercalli Intensity X) or larger. (Available from WDC-A for Solid Earth Geophysics, address inside-back cover.)

Strong-Motion Data from Japanese Earthquakes, Report SE-29, contains 177 plots of uncorrected and corrected strong-motion accelerograms from 53 earthquakes. The events were recorded between 1956 and 1978 at 42 sites. These data are particularly valuable because of the subduction zone environment where they centered. (Available from NGDC, address inside-back cover.)

New Catalog of Strong Earthquakes in the U.S.S.R. from Ancient Times Through 1977, Report SE-31, contains translations of the methodologies used to prepare the catalog, an extensive bibliography, and geographic locations, origin times, and dates of about 6,000 strong earthquakes in the U.S.S.R. from 2100 B.C. through A.D. 1977. (Available from WDC-A for Solid Earth Geophysics, address inside-back cover.)

Historical Seismogram Filming Project: Fourth Progress Report, Report SE-33, gives the status of the project for microfilming historical seismograms (1897-1963). Tables listing seismograph development history, names of seismograph stations and records filmed, and selected earthquake events are included. An appendix shows methods used for microfilming historical seismograms at Mt. Hamilton and Pasadena seismograph stations. (Available from NTIS, address inside-back cover.)

Homogeneous Magnitude System of the Eurasian Continent: S and L Waves, Report SE-34, describes seismic station corrections, calibrating functions, and Homogeneous Magnitude System (HMS) for *S* and *L* waves, both vertical and horizontal components, for the Eurasian continent. (Available from WDC-A for Solid Earth Geophysics, address inside-back cover.)

Documentation of Earthquake Algorithms, Report SE-35, documents existing algorithms for optimally estimating earthquake parameters, including epicenters, focal mechanisms, magnitudes, seismic moment, velocities, and station corrections among others. The algorithms, subdivided by topic, represent a wide range of applications. (Available from WDC-A for Solid Earth Geophysics, address inside-back cover.)

Catalog of Submarine Volcanoes and Hydrological Phenomena Associated with Volcanic Events, 1500 B.C. to December 31, 1899, Report SE-36, describes submarine volcanoes and hydrological phenomena associated with more than 300 volcanic events worldwide. (Available from WDC-A for Solid Earth Geophysics, address inside back cover.)

Inventory of Filmed Historical Seismograms and Station Bulletins at World Data Center A, Report SE-37, describes the Historical Seismogram Filming Project, begun by WDC-A for Solid Earth Geophysics and NGDC in 1979, and the Seismograph Station Bulletin Filming Project, carried out by Saint Louis University researchers during that same period. (Available from WDC-A for Solid Earth Geophysics, address inside-back cover.)

Catalog of Strong-Motion Accelerograph Records, Report SE-38, lists the holdings of strong-motion records, and describes formats in which the records are available. (Available from NGDC, address inside-back cover.)

Seismicity of the Middle East, 1900–1983, Report SE-40, provides calculations of relations between several magnitudes, intensity, and focal depth for the earthquakes in the Middle East. Tabular data include a listing of significant earthquakes and a regional listing of the 5,600 earthquakes used to prepare the catalog and map. The report includes a multicolor map (38" by 43.5") that shows locations of major earthquakes and many smaller events that occurred in the Middle East from 1900 through 1983. The map was compiled from several data files held at WDC-A for Solid Earth Geophysics, and from selected publications. (Available from NGDC, address inside-back cover.)

Popular Reports

Earthquake Information Bulletin, published by USGS, is a bimonthly magazine that translates into understandable terms the techniques used in investigating and describing earthquakes, and that describes past and continuing studies in seismology. (Available by subscription from Superintendent of Documents, address inside-back cover.)

Earthquakes explains the nature and causes of earthquakes and describes the techniques used to detect, record, and measure seismic disturbances. (Available from USGS, Branch of Distribution, address inside-back cover.)

Active Faults of California describes the nature of faults and the earthquake activity related to them. A map shows locations of active faults. (Available from USGS, Branch of Distribution, address inside-back cover.)

Safety and Survival in an Earthquake describes the dangers from earthquakes and outlines actions that citizens can take to reduce those dangers. (Available from USGS, Branch of Distribution, address inside-back cover.)

The Interior of the Earth explains and graphically depicts the structure and nature of Earth's crust, mantle, and core. (Available from USGS, Branch of Distribution, address inside-back cover.)

NGDC, The National Geophysical Data Center, defines the functions of NGDC and briefly describes its products and services. (Available from NGDC, address inside-back cover.)

Seismicity Maps

Seismicity of the Middle East, 1900-1983. It includes a multicolor map (38 by 43.5 inches) that shows locations of major earthquakes and many smaller events that occurred in the Middle East from 1900 through 1983. Earthquakes are displayed on a Mercator projection at a scale of 1:8,000,000; color-coded symbols represent earthquake magnitudes and focal depths. A table below the map gives important information about each major event. See description of Report SE-40 on this page. (Available from NGDC, address inside-back cover.)

World Seismicity Map. This five-color map is 48 by 36 inches (at a scale of 1:39,000,000), and depicts patterns of global earthquake activity from July 1, 1963, through 1972. Dots show earthquake epicenters (body-wave magnitudes 4.5) whose locations were determined using 10 or more station observations. Three colors distinguish the principal depth-of-focus classes (0-70 km, 71-300 km, and 301-700 km). (Available from USGS, Denver Federal Center, address inside-back cover.)

Significant Earthquakes, 1900–79. This four-color map is 54 by 41 inches (at a scale of 1:32,000,000); it shows the location and relative importance of 1,277 significant earthquakes from 1900-79. Of these earthquakes, 682 that caused moderate damage are described in a detailed listing on the map. (Available from NGDC, address inside-back cover.)

Seismicity Map of Middle America. This multicolor 41- by 35-inch map shows the locations of major earthquakes and many smaller events occurring in Middle America for 1900–79. It also includes important information about each major event in a table below the map. Earthquake locations are displayed on a Mercator projection at a scale of 1:8,000,000. (Available from NGDC, address inside-back cover.)

Regional Seismicity Maps. These 20- by 30-inch maps show patterns of regional seismicity of Earth for 1962-69. An index map also is available. The maps by region are:

1. Southwest Pacific
2. Southeast Asia
3. Japan and Kuril Islands
4. Alaska
5. The United States
6. Middle America
7. South America
8. Europe and the Middle East
9. Central Asia
10. North Atlantic Ocean
11. South Atlantic Ocean
12. Indian Ocean
13. Arctic Region
14. Antarctic Region

Available from NGDC, address inside-back cover.)

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